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REAL-TIME ULTRASONOGRAPHIC EVALUATION OF THE LEVATOR ANI AND TRANSVERSUS ABDOMINIS MUSCLES: IS THERE A ROLE IN FEMALE URINARY INCONTINENCE?

Hypothesis / aims of study

Pelvic floor muscle training (PFMT) is an efficacious, low risk intervention and is being proposed as first line treatment for every type of incontinence. Increasing clinical and electromyographic evidence to suggest that the transversus abdominis (TrA) muscle plays a role in the support of the pelvic floor (PF), and co-activation and synchronous contraction of the pelvic floor muscles (PFMs) and the TrA is becoming increasingly recognised. However, the role of the TrA in the pathophysiology of incontinence and functional restoration of continence has not been studied. Similarly, there is inadequate evidence for the association of the anatomical characteristics of the PFMs with the clinical features and severity of the various types of incontinence.

We aimed to investigate possible changes in the levator ani (LA) and the TrA muscles in women with stress or mixed incontinence in comparison with healthy controls. We also examined the effect of combined TrA+PFM training versus PFMT monotherapy on the clinical features of incontinence as well as the changes in the LA and TrA muscles following treatment in an exploratory study.

Study design, materials and methods

In a prospective randomised study approved by the local Scientific Committee, adult women with genuine SUI or mixed incontinence (MUI) with a primarily stress component who had at least 7 episodes of incontinence recorded in a weekly bladder diary, positive cough test, and a 3-4 score in the Oxford scale upon physiotherapist assessment were recruited from a Female Urology Outpatient clinic. Continent volunteers were used as controls. Following written informed consent, women were randomised to 2 arms of physiotherapy, combined TrA and PFM (Group A) training versus PFMT monotherapy (Group B), for a period of 3 months. Treatment efficacy was assessed by the changes in the number of incontinence episodes and/or pads used per 24 hours (as recorded in weekly bladder diaries) and the King's Health Questionnaire at 3 months compared to baseline. All patients were also submitted to real-time 3-D ultrasonographic evaluation (5-9MHz, Voluson 730, General Electric) of the TrA (abdominal approach), the levator ani and the levator hiatus (LH – perineal approach) before and at the end of the treatment scheme. LH surface and TrA thickness were recorded at a) rest, b) maximum contraction of the PFMs, c) maximum contraction of the TrA and d) maximum simultaneous contraction of the TrA and the PFMs. LH data were evaluated using the 4D view Free Version 6.2 software for analysis of 3D volumes. Maximum thickness of the LAs was also measured.

The unpaired t test was used for baseline between-groups statistical comparisons. The paired t test was used for baseline versus post-treatment comparisons.

Results

Forty women with SUI (n=29) or MUI (n=11) and 10 controls were studied. The 2 groups were different in age (mean age 48.9 vs 38.8 years, p=0.016).

Pre-treatment comparisons: There were no significant differences in LH dimensions (in cm^2) between incontinent women and controls in any of the studied conditions: at rest p=0.56 (18.3±4.5 cm^2 vs 17.36±5.1 cm^2), maximum LA contraction p=0.16 (15.0±4.2 cm^2vs 12.9±3. cm^2), maximum TrA contraction p=0.27 (15.8±4.2 cm^2 vs 14.2±4.4 cm^2), maximum simultaneous LA and TrA contraction p=0.12 (14.6±3.6 cm^2 vs 12.5±4.1 cm^2). Thickness of the TrA and the LA muscles was also no different between incontinent women and controls in any studied condition.

Results were also non-significant for baseline comparisons between the 2 incontinence subgroups (SUI vs MUI) and controls.

Pre- versus post-treatment comparisons: Both interventions were highly efficacious despite the small number of patients who completed treatment to date (n=13 patients, with n=7 in Group A and n=6 in Group B). Significant improvements in QoL were seen with both interventions as the KHQ score was reduced in both Group A (p=0.005) and Group B (p=0.043). Decreases in incontinence episodes were also significant in both groups (p=0.035 for Group A and p=0.005 for Group B). Decreases were seen in numbers of pads used in both groups, but did not reach significance (p=0.18 and 0.15 respectively).

Effect on trained muscles: LH dimensions and TrA thickness remained unchanged after treatment in both intervention Groups. However, thickness of the levator ani was found to be increased at the end of treatment in the patients who completed treatment (0.86±0.17 vs 0.66±0.22, p=0.018). The increase was more significant in Group B (p=0.045) as opposed to Group A (p=0.25).

Interpretation of results

Despite the small size of the patient sample, combined TrA+PFM training as well as PFMT monotherapy produced clinically significant improvements in incontinence characteristics and patients' quality of life. The small sample size does not allow for safe efficacy comparisons between the 2 groups. The levator ani may be crucial in efficacy of physiotherapy, but numbers may be too small for safe conclusions on the role of TrA.

Concluding message

Preliminary data suggest that physiotherapy via either combined TrA+PFM training or PFMT monotherapy may be clinically efficacious in the management of stress or mixed incontinence. A post-treatment increase in the levator ani thickness suggests a possible role in restoration of continence. Larger patient numbers are needed for safe conclusions.

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Was this study approved by an ethics committee?	**Yes**
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Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**